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PATENT



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Charles Q. Zhan, et al.

U.S. Serial No.: 10/717,406

Filed: November 19, 2003

For: APPARATUS AND METHOD FOR IDENTIFYING POSSIBLE
DEFECT INDICATORS FOR A VALVE

Group No.: 2863

Examiner: Toan M. Le

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PRE-APPEAL BRIEF REQUEST FOR REVIEW

The Applicants respectfully request review of the final rejection in the above-identified patent application. No amendments are being filed with this request. This request is being filed with a Notice of Appeal. The review is requested for the reasons stated below, demonstrating the clear legal and factual deficiency of the rejection of some or all claims.

Claims 1-23 were rejected under 35 U.S.C. § 102(a) as being anticipated by Gao et al., “Wavelet-Based Pressure Analysis for Hydraulic Pump Health Diagnosis” (“Gao”).

For the convenience of the panel, Claim 1 is reproduced below:

1. A method, comprising:
 - decomposing a signal comprising a plurality of process variable measurements into a plurality of decomposed signals at a plurality of resolution levels, the process variable measurements associated with operation of a valve;
 - grouping the decomposed signals into a plurality of groups, each group comprising decomposed signals at multiple resolution levels;
 - identifying one or more defect indicators for at least some of the resolution levels using the groups; and
 - using the one or more defect indicators to identify a possible defect in the valve;
 - wherein identifying the one or more defect indicators for one of the resolution levels comprises using relationships between the decomposed signals in one of the groups to identify one or more defect indicators at one of the resolution levels.

Claim 1 specifically recites that multiple decomposed signals generated from an original signal are grouped. Claim 1 also specifically recites that “relationships” between the decomposed signals in one of the groups are used to identify one or more “defect indicators” at one of multiple resolution levels. The Examiner fails to show that *Gao* anticipates these elements of Claim 1. As a result, the § 102 rejection of Claim 1 is legally and factually deficient.

Gao is specifically directed to a technique for comparing the wavelet coefficients in a decomposed signal to threshold values for that decomposed signal. If the wavelet coefficients in that decomposed signal exceed the threshold values for that decomposed signal, *Gao* determines that a hydraulic pump is suffering from a fault.

These operations are clearly illustrated in Figures 4 through 9 of *Gao*. For example, multiple decomposed signals are shown in Figures 4(b) through 4(d), and the original signal is shown in Figure 4(a). Here, each decomposed signal in Figures 4(b) through 4(d) remains within threshold

values (represented by dashed lines) for that decomposed signal. This means that a hydraulic pump is not suffering from any faults. In contrast, multiple decomposed signals associated with a faulty pump are shown in Figures 5(b) through 5(d), and the original signal is shown in Figure 5(a). The decomposed signal in Figure 5(d) does not remain within its threshold values. This indicates that a hydraulic pump is faulty in some way. Similarly, multiple decomposed signals associated with another faulty pump are shown in Figures 6(b) through 6(d), and the original signal is shown in Figure 6(a). The decomposed signals in Figures 6(b) through 6(d) do not remain within their threshold values, indicating that the pump is faulty. Figures 7 through 9 illustrate similar behaviors, where normal pumps have decomposed signals that remain within threshold values and faulty pumps have one or more decomposed signals that exceed threshold values.

This functionality of *Gao* cannot anticipate Claim 1. *Gao* specifically describes how each decomposed signal is individually compared to its own threshold values. A faulty pump is identified when a decomposed signal exceeds its own threshold values. Nothing here anticipates “grouping” decomposed signals into multiple groups and then using “relationships” between the decomposed signals in a group to identify a defect indicator. The rejection of Claim 1 based on *Gao* is therefore legally and factually deficient.

Gao does recite that a signal can be decomposed into two sets of sub-band signals (a low-pass set and a high-pass set). (*Gao, Page 972, Left column, First paragraph*). This portion of *Gao* therefore shows that multiple groups of sub-band signals are formed. However, this portion of *Gao* explicitly states that the sub-band signals are “then reassembled to perform wavelet analysis.” In other words, this portion of *Gao* contains absolutely no mention that “relationships” between sub-band signals in a single set of signals are used to identify one or more “defect indicators.”

The Examiner has never specifically identified the elements of *Gao* that represent the “groups” of decomposed signals. The Examiner has also never specifically identified the “relationships between the decomposed signals” in a group that are used to identify a defect indicator. The Examiner may believe that a “group” represents, for example, the signals from Figures 5(b) through Figure 5(d) (the decomposed signals at different resolution levels for a pump). This fails to anticipate Claim 1 since *Gao* never recites that relationships between these signals are used to identify a defect indicator. The Examiner may also believe that a “group” represents, for example, the signal from Figure 4(b) and the signal from Figure 5(b) (two decomposed signals at the same resolution level for a normal pump and for a faulty pump). This fails to anticipate Claim 1 since Claim 1 specifically refers to grouping multiple “decomposed signals” that are generated using the same original signal.

The Examiner chose to reject Claim 1 under 35 U.S.C. § 102. As a result, in order to properly reject Claim 1, the Examiner must show that *Gao* (1) decomposes a signal into multiple decomposed signals, (2) groups decomposed signals at multiple resolution levels into a single group, and (3) uses relationships between the decomposed signals in that group to identify at least one defect indicator. The Examiner has not and cannot make this showing. To make this showing, the Examiner would have to show that *Gao* uses relationships between the wavelet coefficients in Figures 5(c) and 5(d), for example, to identify a defective pump. *Gao* does not operate in this manner.

Gao is crystal clear – the wavelet coefficients in a single wavelength window are compared to upper and lower bounds for that window. If the wavelet coefficients in that single window exceed the upper and lower bounds, this indicates that a pump might be defective. This cannot anticipate

Claim 1, which requires that decomposed signals at multiple resolution levels be grouped and that relationships “between the decomposed signals” in that group be used to identify at least one defect indicator.

For these reasons, the § 102 rejection of Claim 1 under *Gao* is legally and factually deficient. For similar reasons, the § 102 rejection of Claims 8, 15, and 21 under *Gao* is legally and factually deficient. Accordingly, the Applicants respectfully request this case be returned to the Examiner for allowance or, alternatively, further examination.

The Commissioner is hereby authorized to charge any fees connected with this communication or credit any overpayment to Deposit Account No. 50-0208.

Respectfully submitted,

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